Philips Medical Systems

NEWSLETTER **Service**

Issued by	: PMS-DMC Hamburg	**Reference No.**	: XRD Hamburg 100
Publication No.	: 4512 980 62501	**Date**	: July 2005

Information for : FSE Managers Specialists

Adjustment of the factor for duty cycle

APPLIES TO: All OPTIMUS RAD / RF generators release 3.x 50/65/80kW and all Optimus C generators 50/65/80kW with PCB EZ 130 with code No. 4512 108 0908x or code No. 4512 108 0910x.

In the past it happened that the following problems occurred, especially with 50kW generators with only one converter.

Possible symptoms:

- Termination of exposure, especially with high kV values.
- Errors 02HG - 02HH - 00X0 - 02WK.

The ground reference point was changed in the adjusting instructions.

Signal **EZ130 X23** (gain in) is short-circuited with **EZ130 X8**.
This test point is located on the printed-circuit board (see pages 3/7) and it is not accessible from the front.
Use a short cable to establish the connection.

In case of PCBs EZ130 with code numbers 4512 178 0026x or code numbers 4512 178 0028x signal EZ 130 X23 must be short-circuited with EZ X130 X6 at the front.

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1. ADJUSTMENT OF THE FACTOR FOR DUTY CYCLE

1.1. GENERAL INFORMATION

The actual value of the set kV must be attained at least after 2ms. During the kV rise phase there must be neither kV break–in nor a kV overshoot.
The factor duty cycle is based on an adapted tube and determines at local mains voltage and mains resistance conditions:

- kV rise phase
- kV behavior during the exposure in falling load technique.

The factor duty cycle is stored in the memory of PCB CU EZ139.

Refer to figure 1:

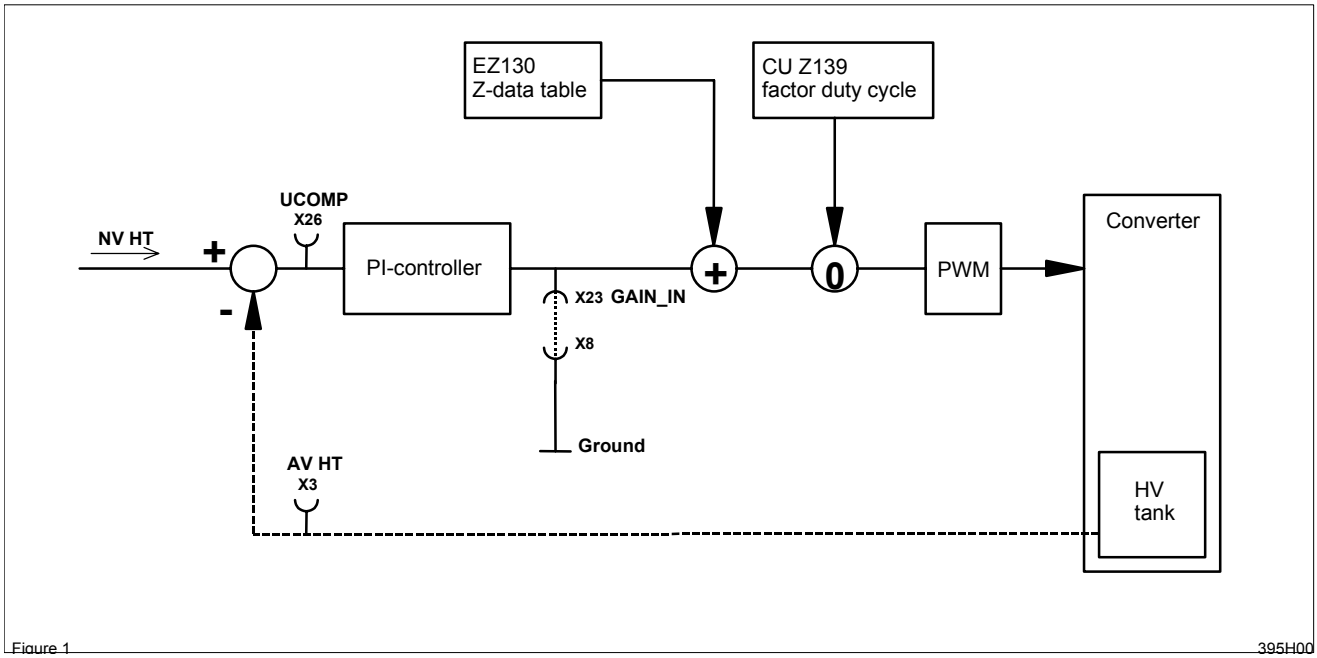

Figure 1 395H00

During alignment this factor duty cycle must be entered via AGenT. The influence of this factor as a correction
value for the Z–data table is monitored as the U_{COMP} signal, since the PI–controller is deactivated by the grounded *GN_IN* signal.

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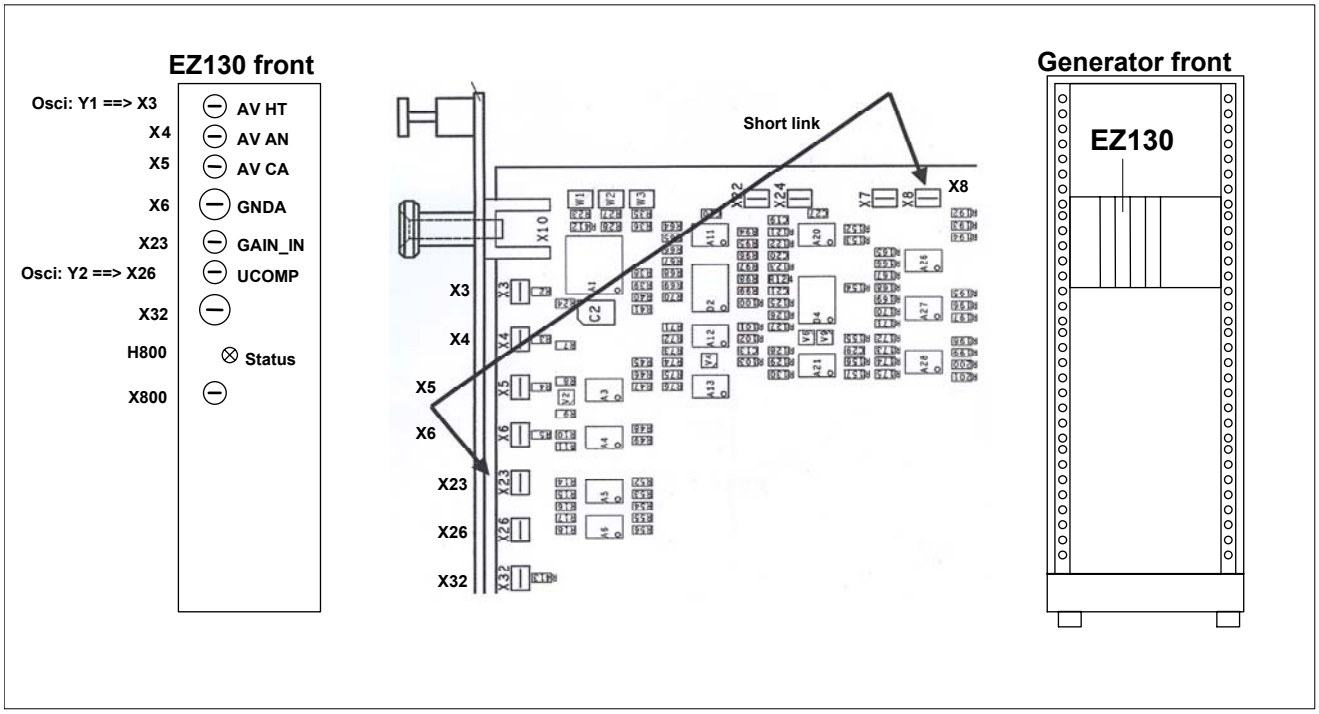
1.2. CONNECTING AND SETTING THE SCOPE

- Turn OFF generator and ENF1.



Channel 1 = EZ130 X3 ---> *AV HT* ---> 20kV/V ---> 1V/div --> Zero–line at bottom of screen
Probe GND = one of the drilling holes at the front cabinet chassis

Channel 2 = EZ130 X26 ---> U_{COMP} ---> 1V/div ---> Zero–line 2 div from bottom of screen
Probe GND = one of the drilling holes at the front cabinet chassis

Trigger = external (preferred) ---> *CTRL_X_C/* ---> backpanel EZX74 / negative slope
or = internal channel 1 ---> *AV HT* ---> EZ130 X3 / positive slope at +3V
Probe GND = one of the drilling holes at the front cabinet chassis

Time base = 5 or 10ms/div ---> trigger delay -1div

NOTE

A digital scope should not have any other ground connection than the ground of the three probes at the drilling holes at the front generator chassis.
A mains–driven scope must be isolated from earth potential, otherwise it might display artefacts.

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1.3. DEACTIVATING THE kV CONTROLLER

- Connect EZ130 X23 GAIN_IN and X8 on board with a short link (use a short wire).

CAUTION

This alignment requires exposures with high kV.
Be sure the tube has been warmed up before.

1.4. SETTING OF EXPOSURE DATA

- Switch ENF1 and the generator ON.

  a) Set 141kV in case
  - of 65/80kW generators
  - the tube limit (of at least one tube) is 150kV, perform this adjustment at the tube which has the highest kV limit programmed.

  b) Set 125kV in case
  - of 50kW generators
    and
  - of 65/80kW generators if the programmed application limit of the tube limit is 125kV

NOTE

Disconnect the short link between X23 and X8.
Start over this adjustment from chapter 1.3. onwards if the tube conditioning was successful.

- Set kV and mA values according to the programmed tube limits:

  a) 141kV: 200mA at kV_4 (65/80kW)

  b) 125kV: 100mA at kV_3 (50kW)
  200mA at kV_4 (65/80kW)

- Set the exposure time: 40ms

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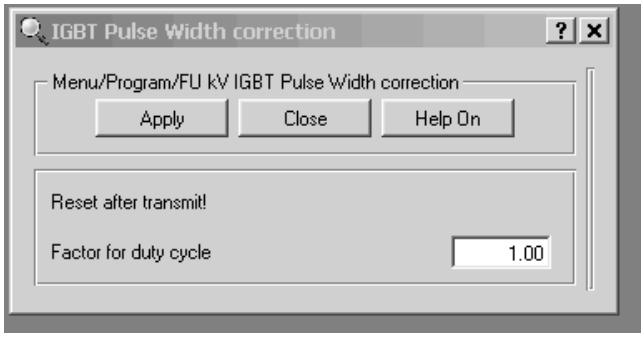
1.5. ADJUSTMENT OF THE FACTOR FOR DUTY CYCLE

- Adjust the factor duty cycle via service software AGenT by measuring U_{COMP} with the scope.

- Connect the service PC and start AGenT:
  Select menu:
  Program / FU KV IGBT Pulse Width correction.

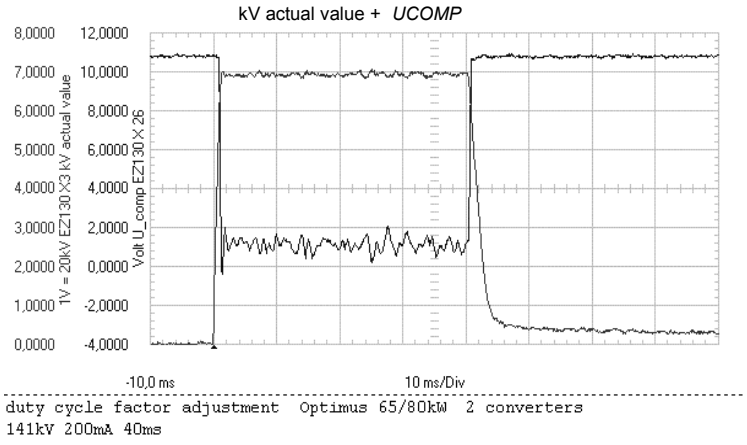
- Set the starting value factor duty cycle to **1.00**:



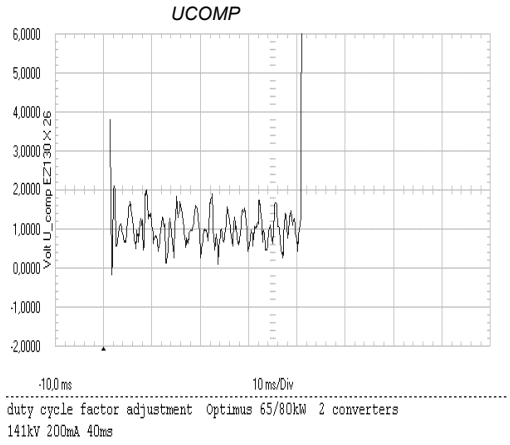
- If the U_{COMP} value does not match the requirements type in another factor duty cycle value.
  Transmit the factor by clicking on “Apply” with the left mouse button and push the active RGDV button to get the new value validated.

- Switch an exposure.
  The values are measured in the stationary condition. The transient behavior at the beginning of the exposure is not taken into account.

Result: In standby the U_{COMP} value is at about +11V, during exposure the mean value U_{COMP} must be as given in table 1, refer to figure 4:



Oscillogram of a perfect alignment for 141kV



UCOMP for 141kV

Figure 4 401H00

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a) 141kV setting (65/80kW only)

- Read the mean value of U_{COMP} for 141kV (see scope figure 4 or 5), correct the factor duty cycle till U_{COMP} meets the required reference of +1V.

kV setpoint	mA setpoint	PCB type	U_{COMP}	Tolerance	kV peak of *AV HT*	Factor duty cycle	Date
141kV	200mA	PCB kV_control 4:	+1V	±0.5V	138kV		

Table 1: Factor duty cycle, settings 141kV (150kV limit)

Example how to correct the factor duty cycle:

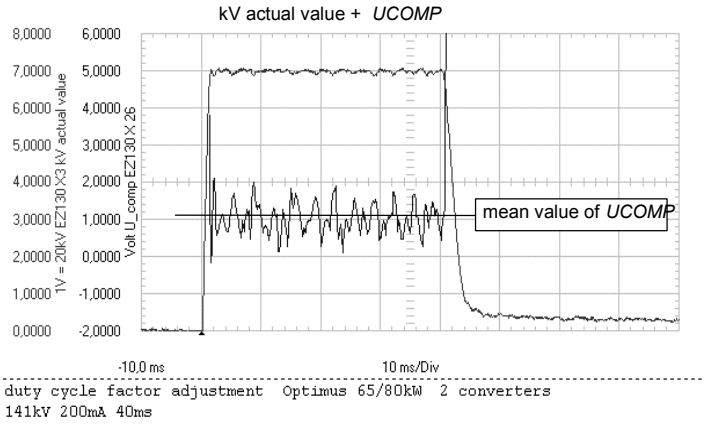
PCB kV_control 4

- If the mean value of U_{COMP} is: > +1.5V **increase** the factor duty cycle in steps of 0.01
  < +0.5V **decrease** the factor duty cycle in steps of 0.01

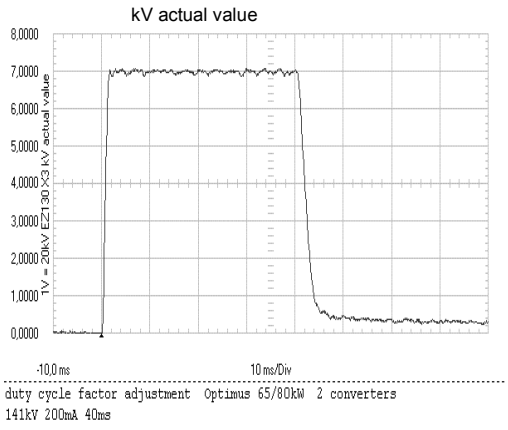
- Check also the kV peak value *AV HT* (not the overshoot), it must be **138kV** for **141kV** setpoint. (see scope figure 5)

- Remove the short link EZ130 X23 *GAIN_IN*.

- Record the results in table 1.



Optimus 80kW with 141kV, *UCOMP* = +1V



AV HT with overshoot

Figure 5 402H00

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b) 125kV setting

- Read the mean value of U_{COMP} for 125kV (in principle figure 4 or 5).
- Correct the factor duty cycle till U_{COMP} meets the required reference of 0V.

kV setpoint	mA setpoint	PCB type	U_{COMP}	Tolerance	kV peak of *AV HT*	Factor duty cycle:	Date
125kV	100mA	PCB kV_control 3:	+0V	+1V / -=.5V	125kV		
125kV	200mA	PCB kV_control 4:	+0V	±0.5V	125kV		

Table 2: Factor duty cycle, 125kV limit

Example how to correct the factor duty cycle:

PCB kV_3

- If the mean value of U_{COMP} is: > +1V **increase** the factor duty cycle in steps of 0.01
- < -0.5V **decrease** the factor duty cycle in steps of 0.01

PCB kV_4

- If the mean value of U_{COMP} is: > +0.5V **increase** the factor duty cycle in steps of 0.01
- < -0.5V **decrease** the factor duty cycle in steps of 0.01

- Check also the kV peak value *AV HT* (not the overshoot), it must be **125kV** for **125kV** setpoint.
- Turn OFF generator and ENF1.
- Remove short link EZ130 X23 *GAIN_IN*.
- Record the results in table 2.

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